Unit 15.5
Day 2
Finding Asymptotes of Rational Functions
Part 1

4.6 Graphing rational functions

Rational expression

$\frac{h}{g}$, where h & g are polynomial and $g \neq 0$.

Rational function

$f(x)=\frac{h}{g}$

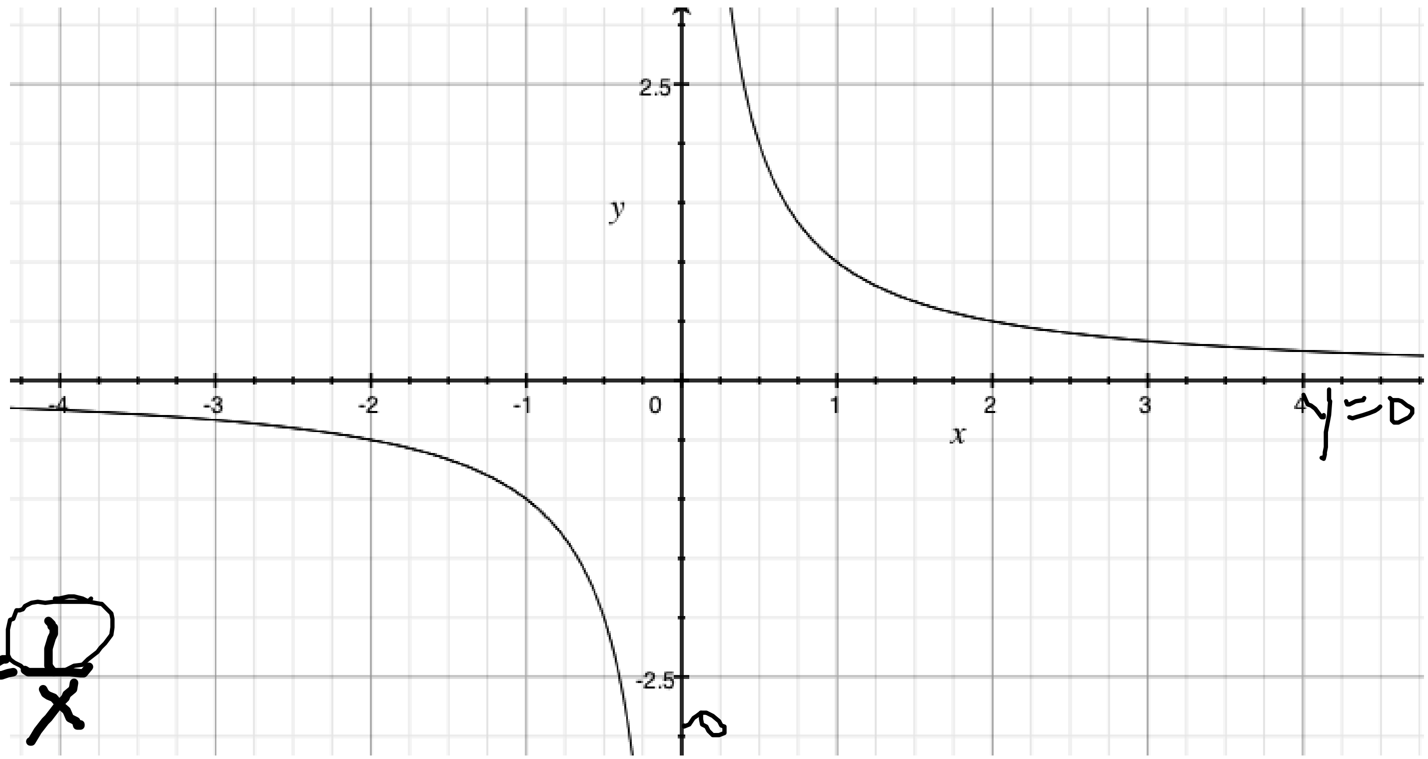
Finding the asymptotes of a rational functions

Three types of asymptotes:

1) Vertical asymptote $x = \text{constant}$
2) Horizontal asymptote $y = \text{constant}$
3) Oblique asymptote $y = mx + b$

1) vertical asymptotes-is (are) vertical line(s) that the graph will never cross.

What are the vertical and horizontal asymptotes of this graph and why do they occur?



$y=0$

$f(x)=\frac{1}{x}$

$x=0$

Finding the vertical asymptotes: set the denominator equal to zero to find the values of x that make the function undefined.

Ex1: $f(x)= \dfrac{x+1}{2x^2+5x-3}$

$2x^2+5x-3 \neq 0$

$(2x-1)(x+3) \neq 0$

$x \neq \frac{1}{2} \quad x \neq -3$

Asym.: $x=\frac{1}{2}$

$x=-3$

Ex2: $f(x)= \dfrac{3}{-x^3-5x^2-4x}$

$-x^3-5x^2-4x \neq 0$

$-x(x^2+5x+4) \neq 0$

$-x(x+4)(x+1) \neq 0$

$x \neq 0 \;|\; x \neq -4 \;|\; x \neq -1$

$x=0,\ x=-4,\ x=-1$

FINDING HORIZONTAL ASYMPTOTES

1) If the

degree of the numerator = degree of the denominator

then

the horiz. asymptote equals the ratio of the leading terms

2) If the

degree of the numerator $<$ degree of the denominator

then

the horiz. asymptote $y = 0$.

3) If the

degree of the numerator $>$ degree of the denominator

then

divide the num. by den. The quotient is the oblique asymptote (ignore remaider)

Finding horizontal asymptotes:

Ex1: $f(x)=\dfrac{x+1}{2x^2+5x-3}$

$y=0$

<u>Ex2:</u> $f(x)= \dfrac{2x^2-3x+1}{5x^2+6x+1}$

$$y = \frac{2}{5}$$

Finding an oblique asymptote:

Ex3: $f(x)=\dfrac{x^2+7x+6}{x}$

$$\begin{array}{r|l} & x+7 \\ \hline x & x^2+7x+6 \\ & -x^2 \\ \hline & \quad 7x+6 \\ & \quad -7x \\ \hline & \qquad +6 \end{array}$$

$y = x+7$

Homework

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